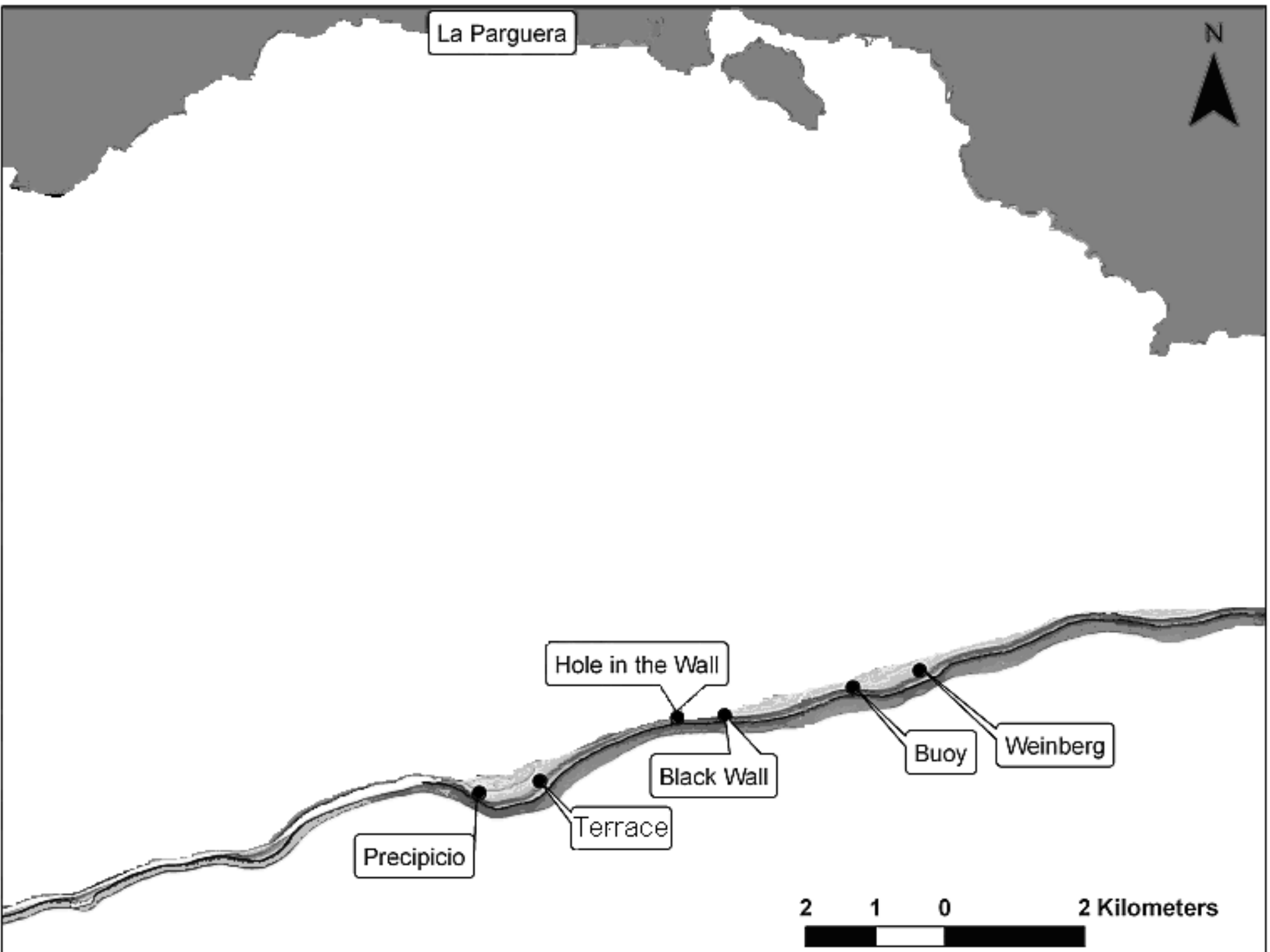


Deep (>50 m) Mesophotic Fishes



Deep Coral Reef Ecosystem Studies

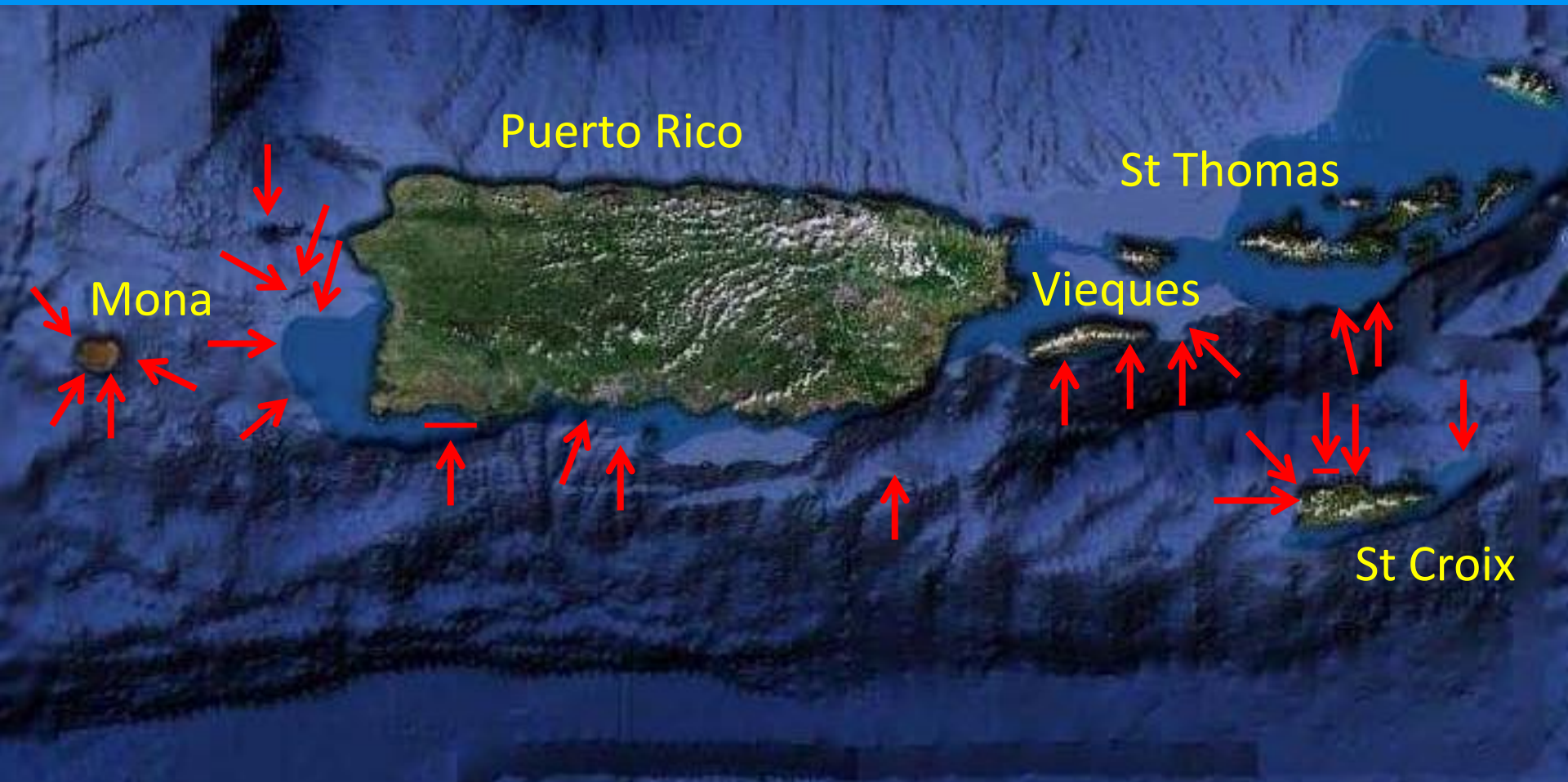
- From NOS/CSCOR to UPRM/CCRI
- Two Parts
- Exploratory Survey of Mesophotic Coral Ecosystems (MCEs) 50 – 100 m
 - Characterize communities
 - Variations with depth
 - Variations with habitat features (slope, rugosity)
 - Seasonal variations over 1 year
 - Assess Connectivity between deep and shallow
 - Assess vulnerability
 - Focused at La Parguera PR
 - Target depths were 50 & 70 m



Deep Coral Reef Ecosystem Studies

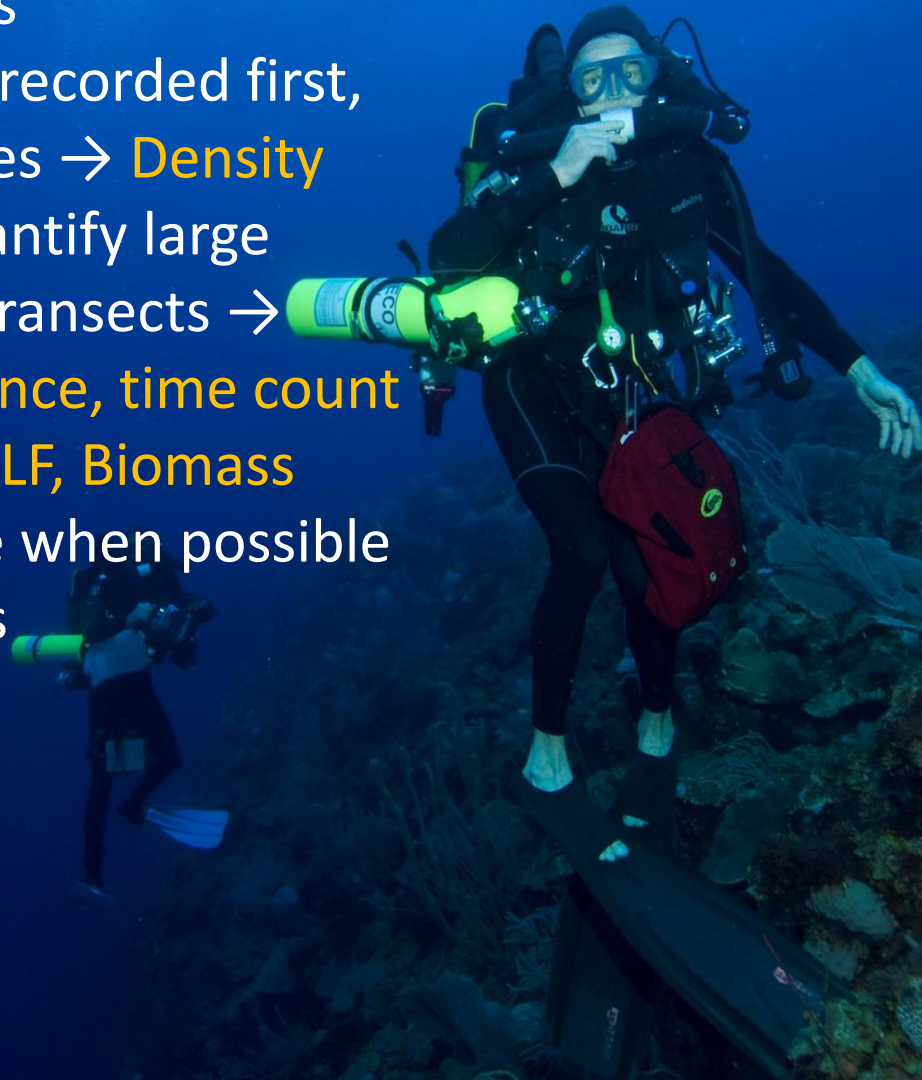
- Survey of MCEs across the US Caribbean
 - Sites surveyed once, @ 50 & 70m
 - Sites along insular slope
 - Exploratory – no statistical design
 - Targeted a range of geomorphologies
 - Direction of swell
 - Slope
 - Main island, small island, submerged bank
 - 3 cruises over 3 years

Overall Site Locations



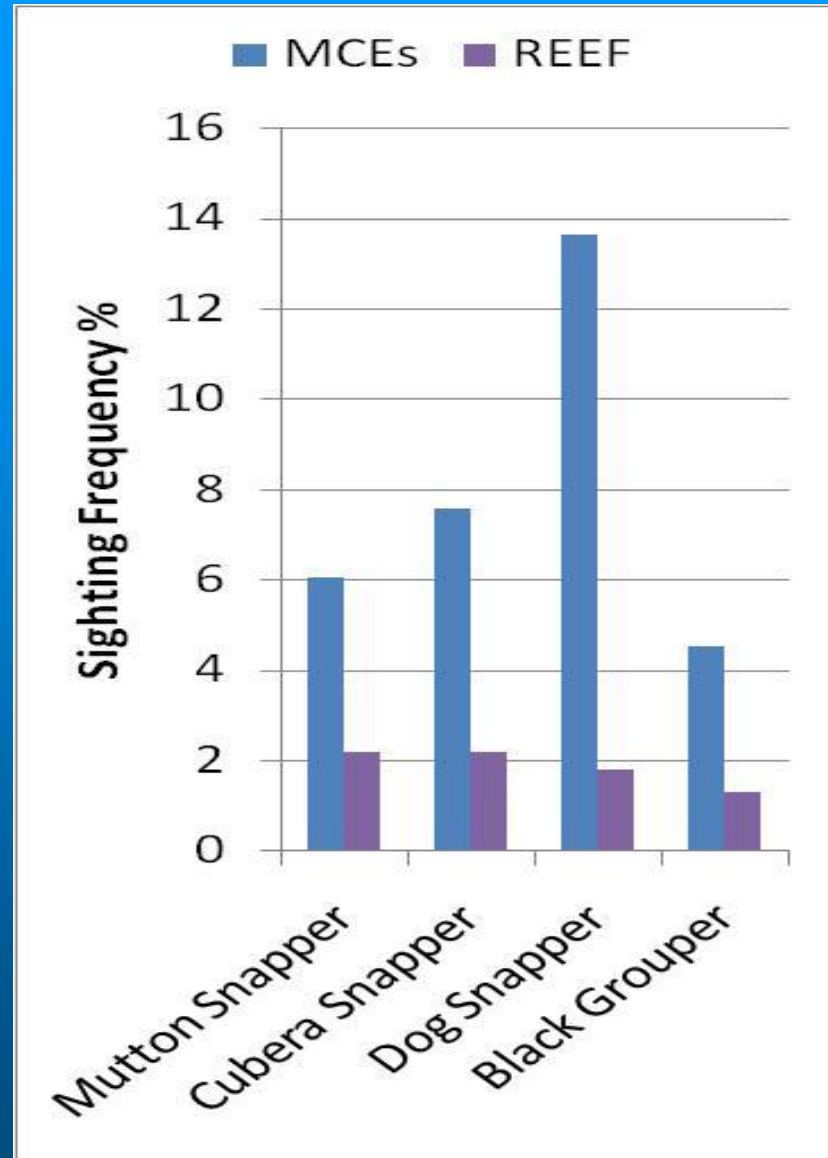
Methods

- Visual census using trimix rebreathers
- 10 x 3m belt transects
- Evasive species were recorded first, then sedentary species → Density
- Roving surveys to quantify large species outside belt transects → Frequency of occurrence, time count
- Length estimation → LF, Biomass
- 2 sets of surveys/dive when possible
- Total time 15 minutes

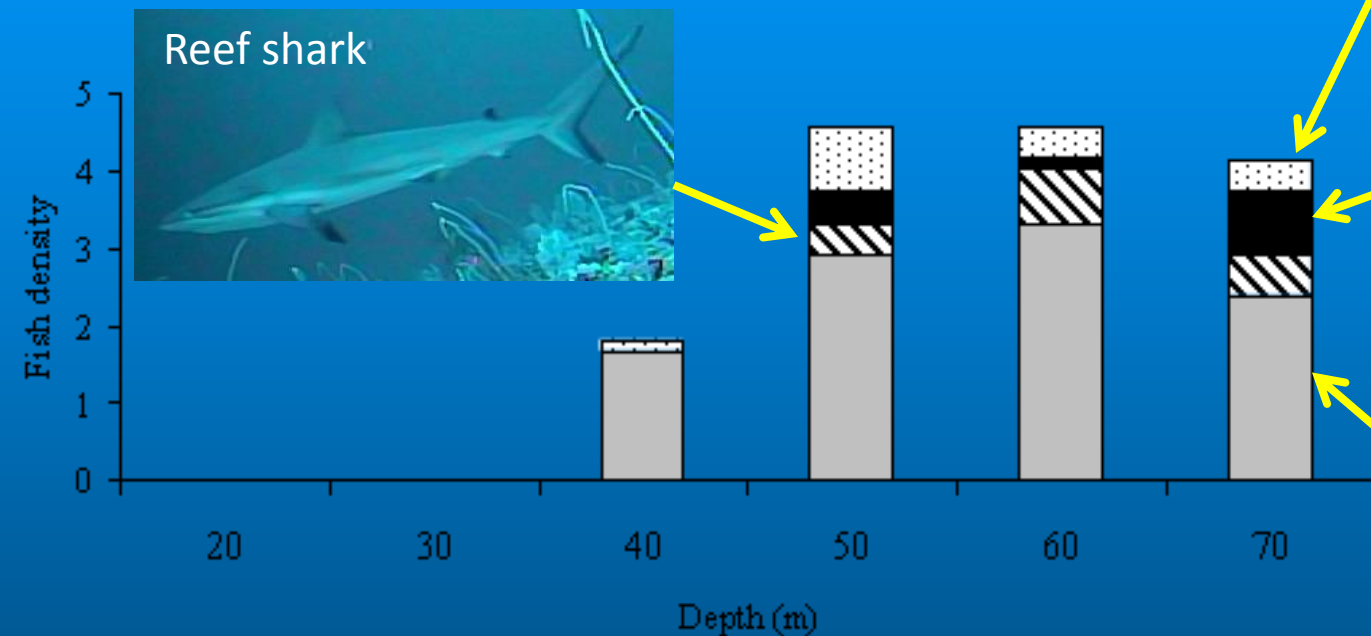


Deep MCEs as refugia
for shallow exploited
species

Are we missing key
population segments?



Abundance of large bodied predators increases with depth



Black grouper



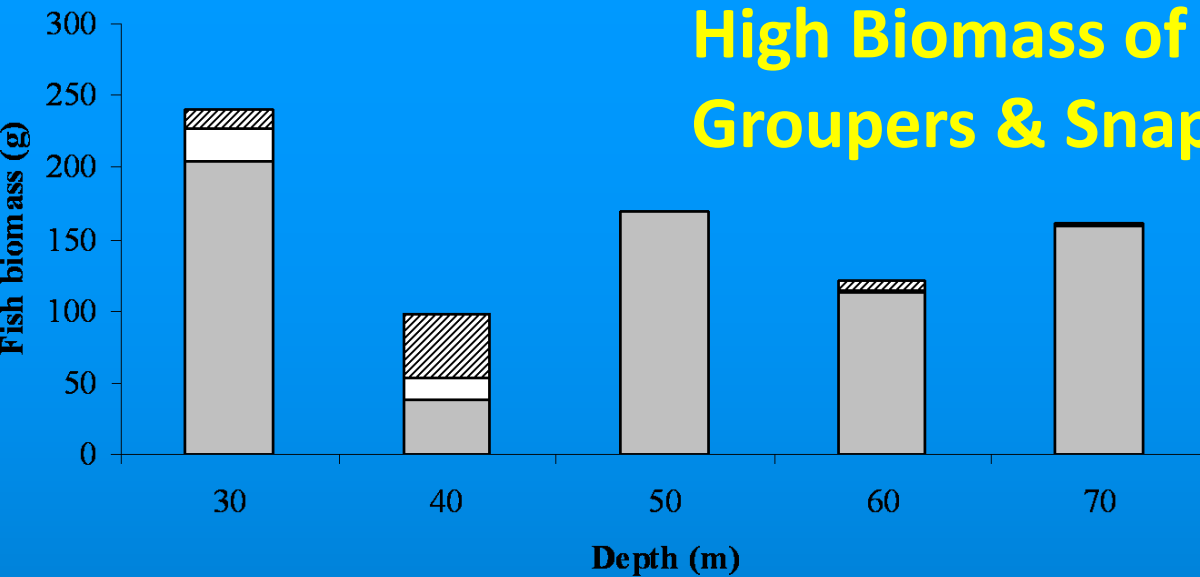
Cubera snapper



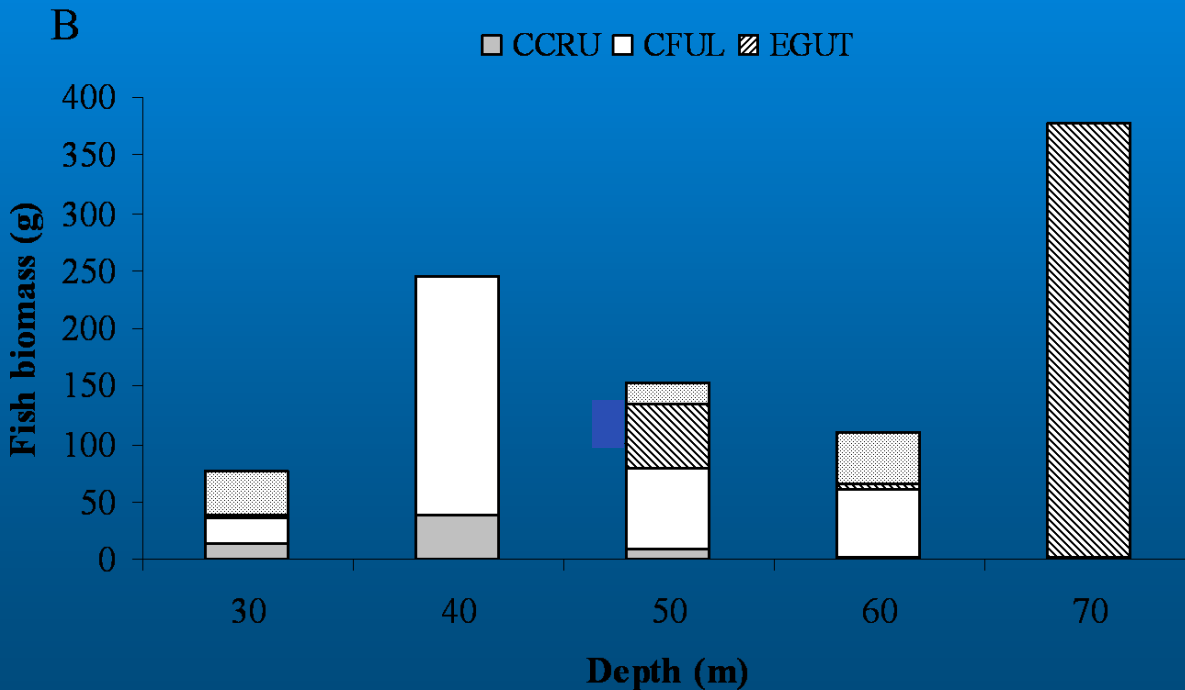
Dog snapper



High Biomass of Medium-bodied Groupers & Snappers in MCEs



Red Hind
Coney
Graysby



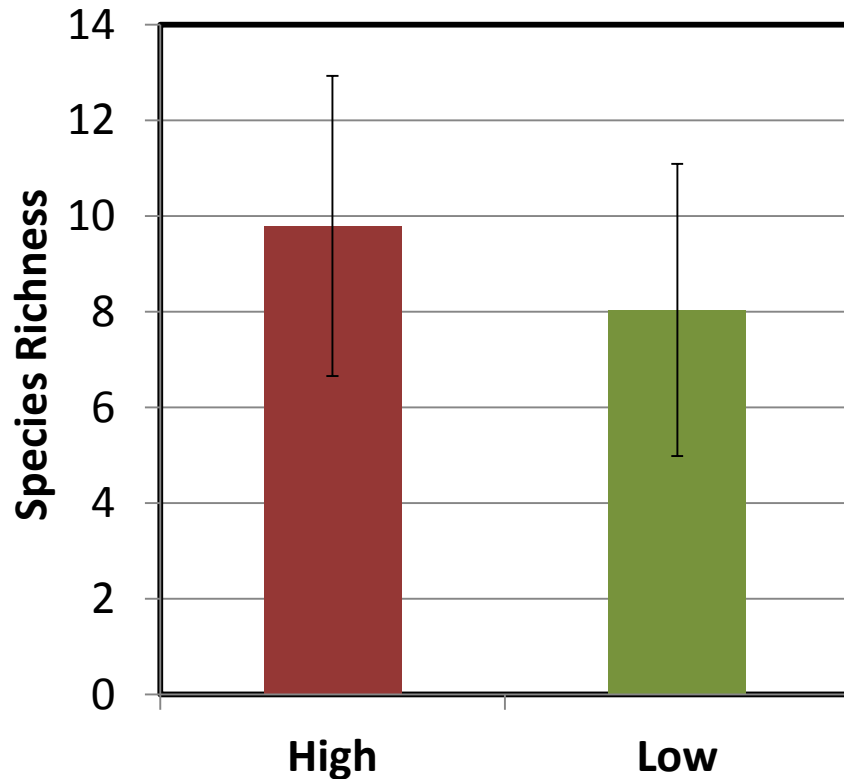
Yellowtail Snapper
Schoolmaster
Mutton Snapper
Mahogany Snapper



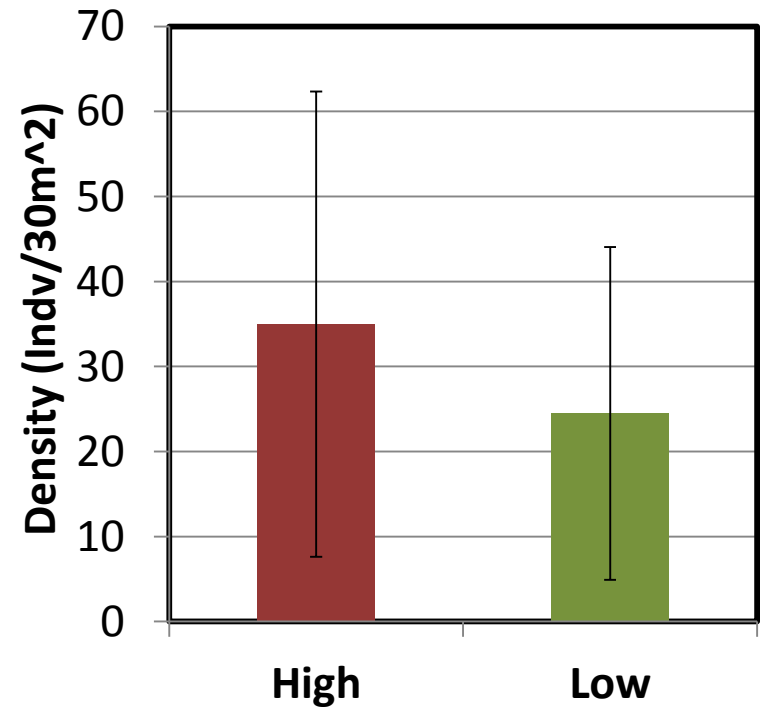
Spatial Variation

Rugosity & Slope

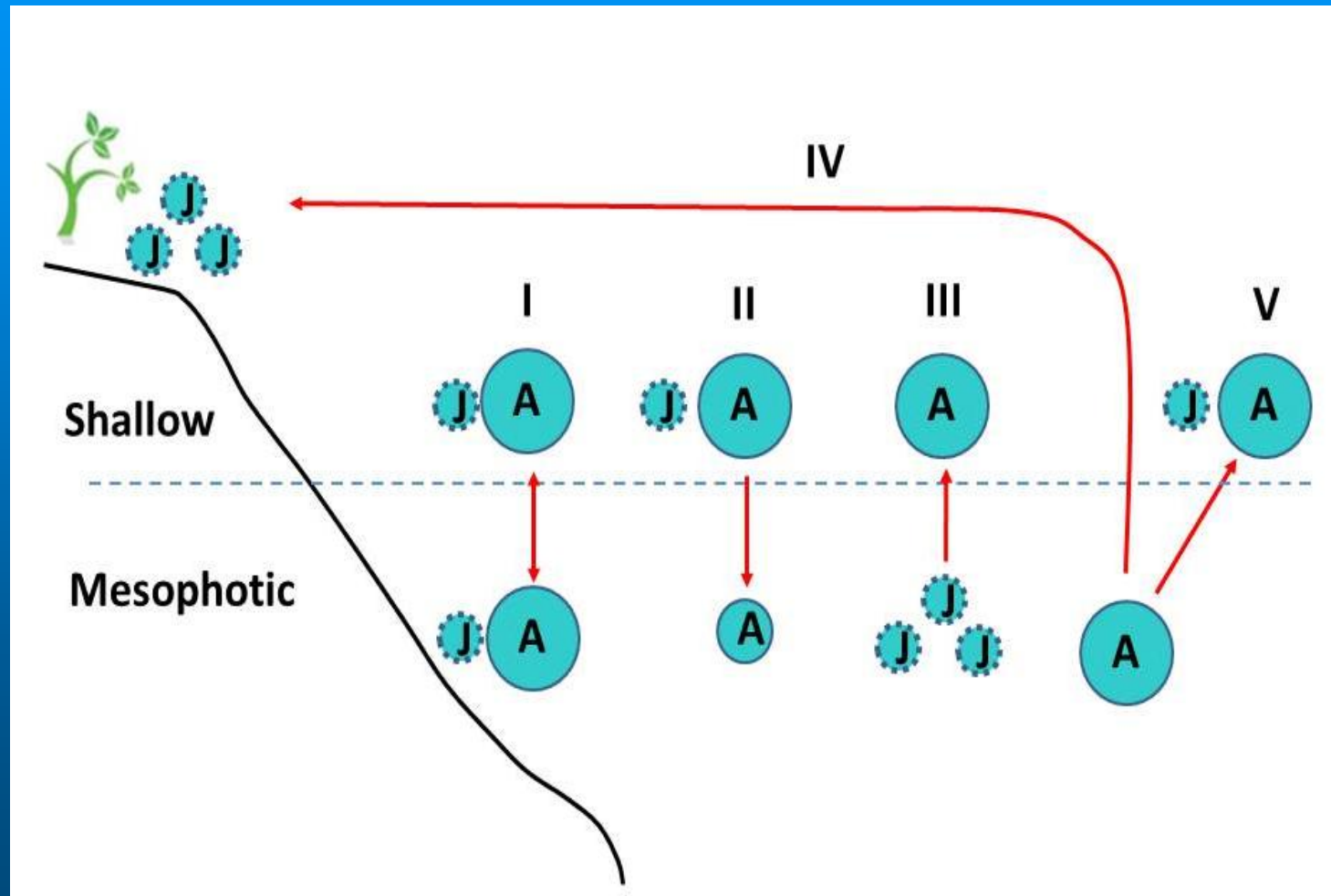
Mean Species Richness (Stdev)
p=0.002, Rank Sum Test



Mean Density(Stdev) of all
Species
p=0.006, Rank Sum Test



Mesophotic fishes show strong connectivity and interdependence with shallow reef systems



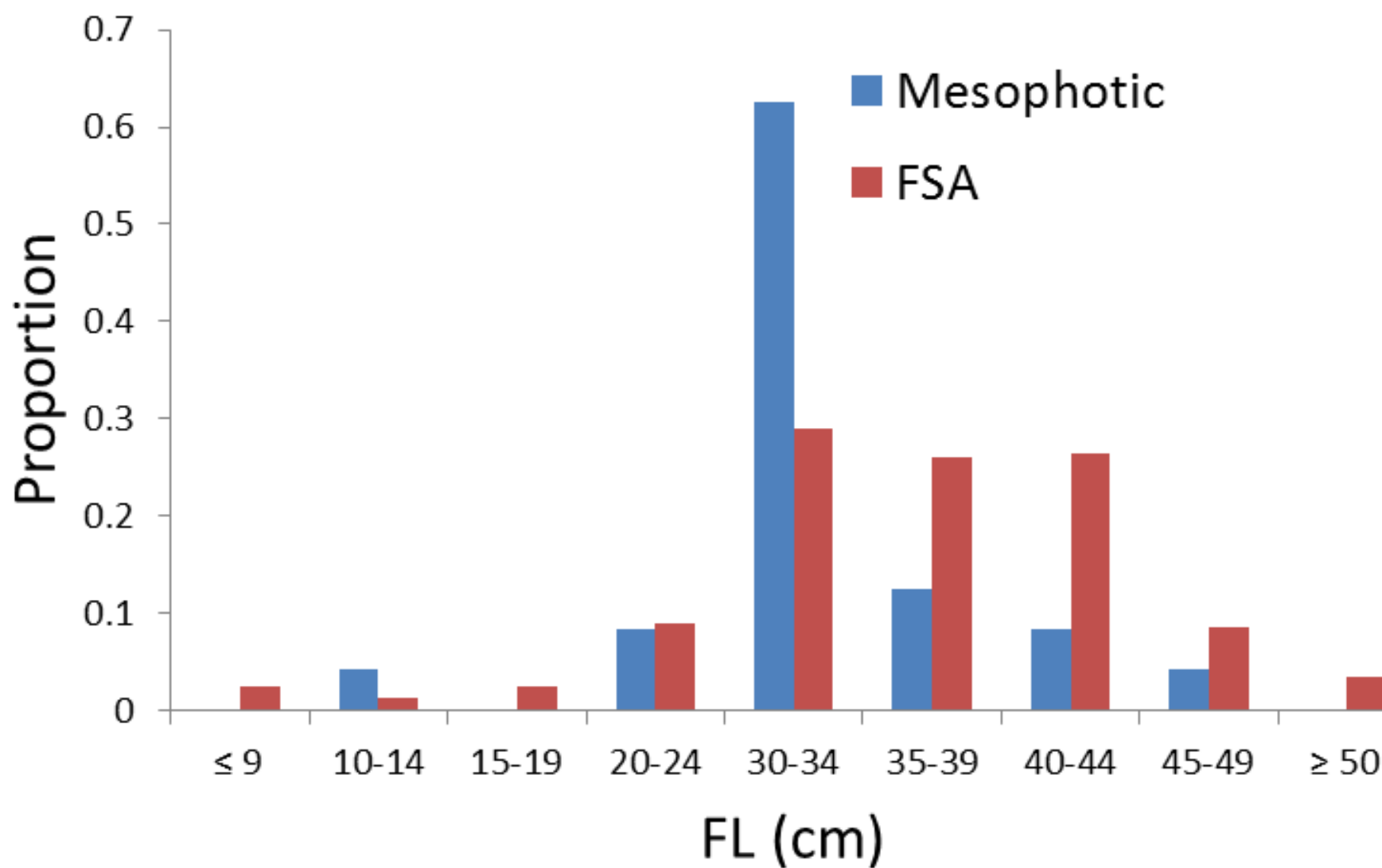
Red Hind - Mesophotic Cruises

Only one diver conducting surveys

33 red hind observed

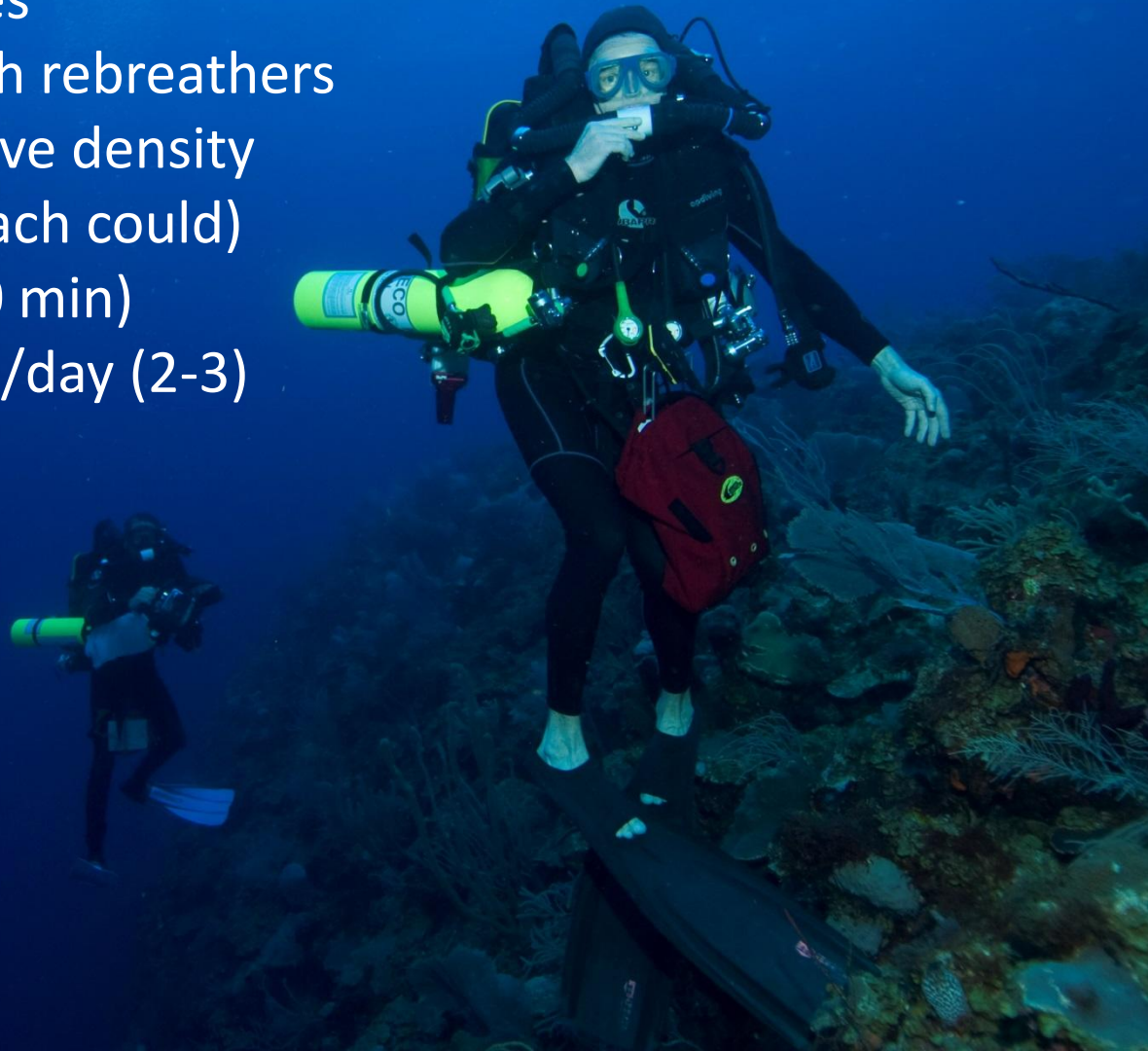
Frequency of Observation = 23.4%

- 15 transects with RH
- Mean = 2.20
- Std Dev = 1.265
- 64 transects overall
- Mean = 0.516
- Std Dev = 1.113

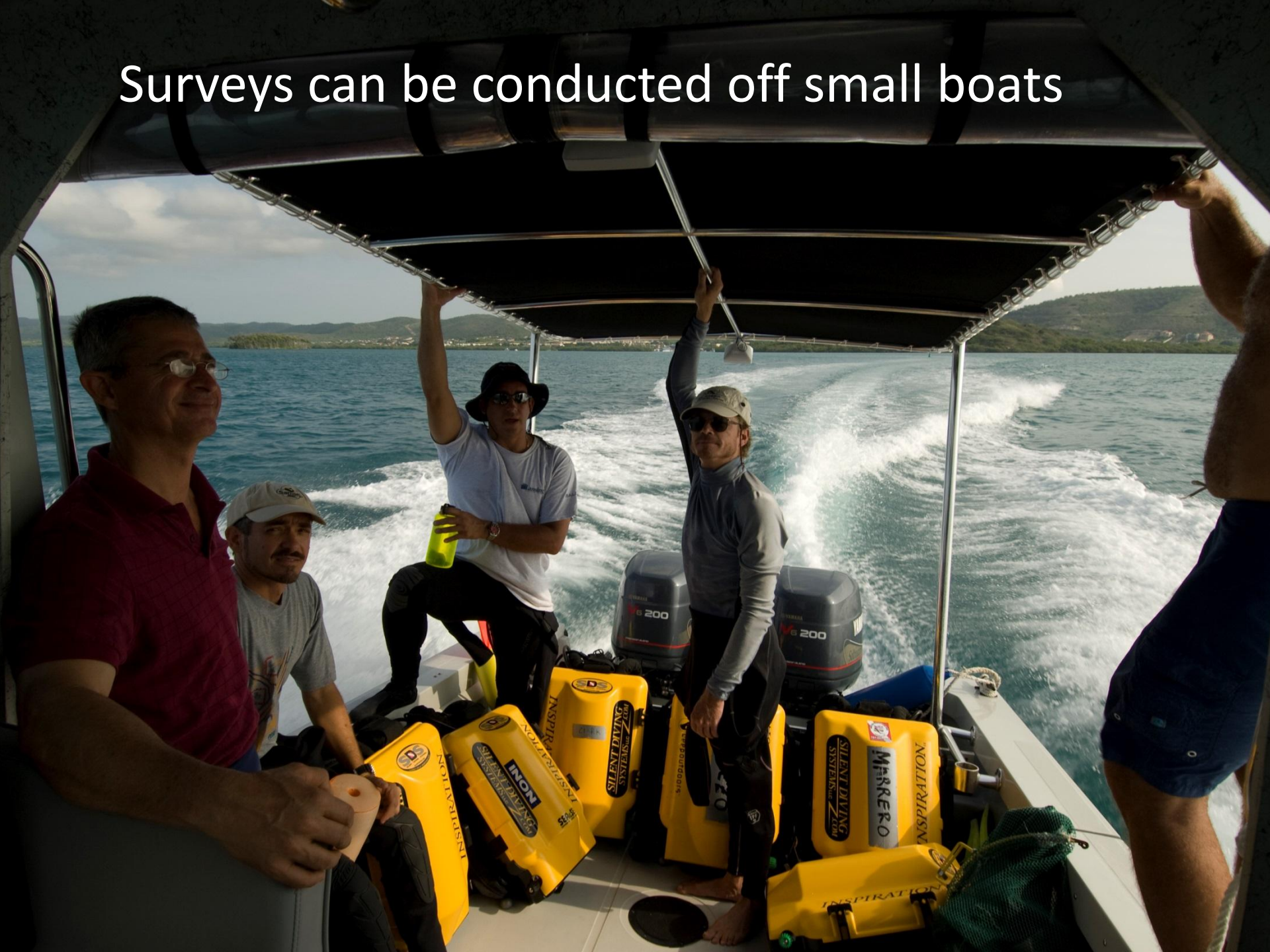


Methods - Limits

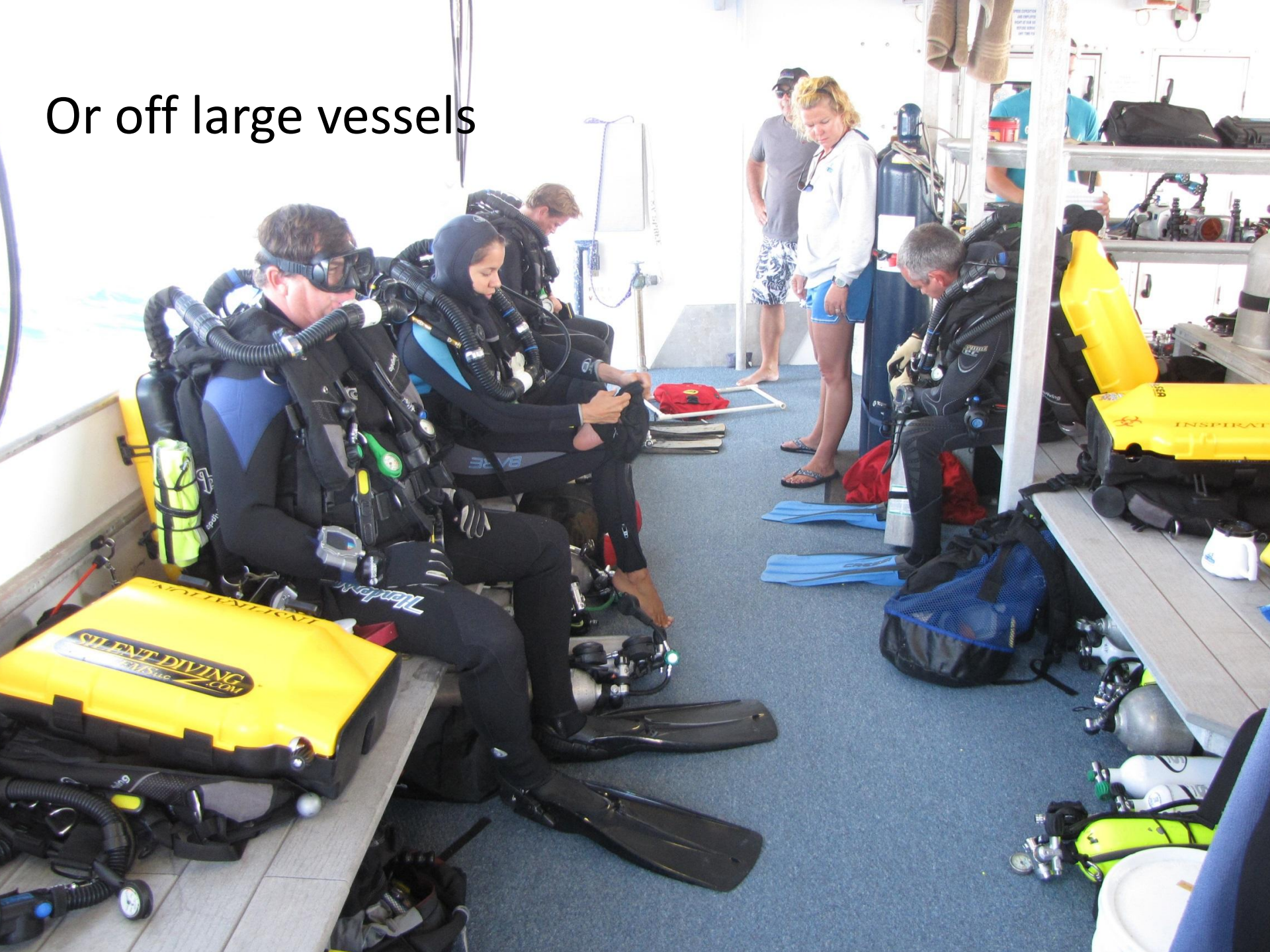
- Non cryptic diurnal fishes
- Diver avoidance less with rebreathers
- Roving surveys do not give density (but line transect approach could)
- Limited bottom time (20 min)
- Limited number of dives/day (2-3)



Surveys can be conducted off small boats



Or off large vessels





But must supply
all the gases: air,
oxygen, helium



And diver safety
is important!

Gear is expensive

Training takes ~ 1 year to 100 m



Need for Creative Funding



